dCS 950 / 952

Digital to Analogue Converter

User Manual

Software version 6.1x, 6.2x

22nd May 2000

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[1] ***dCS*** Ltd is Data Conversion Systems Ltd. Company registered in England no. 2072115

PRODUCT FEATURES

Formats

PCM at 32, 44.1 or 48 kS/s, 88.2 or 96kS/s (***dCS 952*** only).

Data formats supported are: AES/EBU (XLR), SPDIF (RCA Phono), SDIF-2 (BNC) or Dual AES (***dCS 952*** only).

Syncing

Can sync to Word Clock or input signal.
Sync to video option available.

Functions

Very high performance DAC, free from gain ranging.

Test Generator

High quality audio signal generator.

Ease of Use

Remembers last settings.
Automatic input selection.
Front panel lockout.
Software upgrade-able without opening the box.
Can be remote controlled from PC.
Automatic format selection for Single or Dual AES (***dCS 952*** only).

CONTENTS

Product Features **3**

CONTENTS **4**

About this Manual 5
Warranty 5

Using Your *dCS 950 / 952* For The First Time **6**

Product Overview 6
What's in the Box? 6
Mains Voltages 6
Installing Unit in a Rack 6
Getting Started 8

The Hardware – Controls and Connectors **10**

Rear Panel 10
Front Panel 12

The Software – the Menu **16**

Overview 16
The Menu Sequence 17
Menu Items 18

Typical Applications **24**

Using a Master Clock to Sync a *dCS 950* or *952* 24
Upsampling a CD player 25
Replaying 24/96 from a Nagra-D recorder 26
Six Channel Set Up 27
A / B Comparisons 28

***dCS 950 / 952* Technical Information** **30**

Anti Image Filtering 30
Clocking 31
Sample Alignment 32
Digital Interface Specifications 33
Analogue Interface Specifications 34
Frequency Response 35
AES3 (AES/EBU) Format 36
SDIF-2 39
Power Consumption 41
Size, Weight and Operating Conditions 42

Options **44**

Maintenance and Support **46**

Hardware 46
Software 47
Hardware Update 47
Safety and Electrical Safety 47

TroubleShooting **48**

Error Codes and Messages 48
Internal Device Error Codes 48
System Messages and Error Codes 49
Trouble Shooting Your System 49

***dCS* Support** **52**

I wish 52
If You Need More Help 52
Other Information 52

Indexes and Software Version Numbers **53**

About this Manual

Note that there is a fuller Contents at the end of the manual (page 54), along with an index and lists of figures and tables.

References to other sections in the text have the **"Section Name"** page … in quotation marks and bolded.

IMPORTANT! *Important information is presented like this - ignoring this may cause you to damage the unit, or invalidate the warranty.*

The manual is designed to be helpful. If there are points you feel we could cover better, or that we have missed out - please tell us.

Warranty

Your ***dCS 950*** or ***dCS 952*** is guaranteed for a period of 12 months against faulty workmanship or materials. Warranty repairs should only be carried out by ***dCS*** or an authorised distributor. This warranty will be invalidated if the unit is misused or tampered with in any way.

USING YOUR *dCS 950 / 952* FOR THE FIRST TIME

Product Overview

The ***dCS 950*** and ***dCS 952*** DAC (Digital to Analogue Converter) are high performance converters intended for studio and live recording applications. They are designed to produce very high standard analogue output from standard formats (for example Red Book CD or 24/96). AES3, IEC958 (SPDIF) and SDIF-2 PCM formats are all supported. Multiple units may be slaved to a master clock for stable multi-channel operation.

The unit is mains powered and is housed in a 1U (1.75") high 19" rack mounting case. It may be controlled either from its front panel, or from a software based remote control running on a PC. The last setting is automatically stored on power down, so that fixed installations may be set up at leisure, installed and then left alone. Unauthorised alterations to settings may be prevented by a "front panel lockout" feature.

The unit is highly software based, and more functions and features will be added from time to time. Software updates from ***dCS*** are free![2]

What's in the Box?

The contents of the box are at least:

dCS 950 or ***dCS 952***
User Manual
Function Menu Guide
Mains Lead
2 Spare Fuses
Remote cable
Remote software

Mains Voltages

The ***dCS 950 / 952*** is shipped with its mains voltage preset for operation in the destination country. The voltage is not intended to be changed by the user. If it needs to be changed, contact your dealer or ***dCS***.

IMPORTANT! *This unit **MUST** be earthed!*

Installing Unit in a Rack

The unit is supplied with 19" rack mount ears fitted. If the unit is not to be rack mounted, the ears may be removed. If it is to be installed in a 19" rack, the ears supplied may be used to locate it in the rack - but:

IMPORTANT! *The ears should not be used as the only mechanical support. The unit should rest on a shelf, or be supported in some other way. The ears will just locate it in the rack, and stop it sliding forwards.*

[2] Free if we email them, and you download from a PC com port. Low cost if you ask us for EPROMs or other media - we charge for media and handling.

Contact *dCS* on + 44 1799 531 999
(inside the UK replace + 44 with 0)
email to: more@dcsltd.co.uk
web site: www.dcsltd.co.uk

Getting Started

Here's what to do:

(If the unit does not behave the first time you power up – contact your dealer, or ***dCS***.)

do this: Check the appropriate mains supply for your local mains is marked on the rear panel.

do this: If it is, using the lead supplied, connect the unit to the mains - connect no other leads at this stage - and switch on.

The 7 segment display will briefly show:

- - - - -

or

- - - d 2

and then indicates that it is out of lock:

o u t

do this: Ensure your system volume is set to a low level, then connect the analogue outputs (either balanced or unbalanced) to the inputs of your pre or power amplifier.

do this: Connect the digital output of a CD player or recorder to the **SPDIF1** input and if the **SPDIF1** input is not already selected, press the **SPDIF1** button.

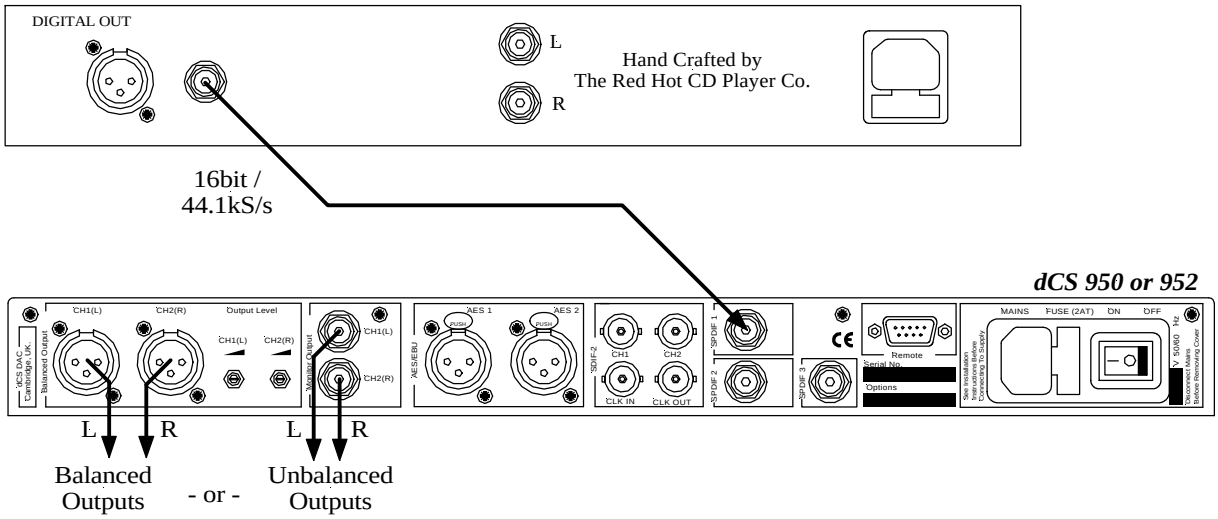

Figure 1 – Playing back a CD

The unit will detect the sample rate, lock to it and unmute. The display will show the sample rate, for example:

4 4. 1

do this: If the **Mute** LED is still lit, press the **Mute** button once.

You should have audio.

Note that the balanced and unbalanced outputs are active simultaneously on the ***dCS 950 / 952*** and may both be connected to external equipment simultaneously if required.

Now you will need to familiarise yourself with how the front panel controls and the menu system work.

do this: Read the short section on **"The Software – the Menu"** on page 16 so you know how the buttons and menu work.

You may also find it convenient to refer to the **Function Menu Guide** while you are getting to know the unit.

THE HARDWARE – CONTROLS AND CONNECTORS

Rear Panel

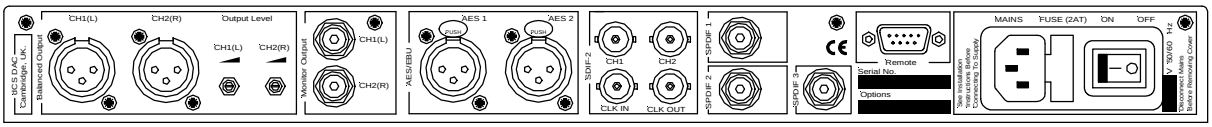

Figure 2 – Rear panel

All input and output connectors are mounted on the rear panel. Individual connectors are clearly identified by the panel legend. Viewed from the rear from left to right, the connectors are as follows:

Balanced Analogue Outputs **3 pin XLR male (2 off)**

Unbalanced Analogue Outputs **RCA phono (2 off)**

Output Level Adjustment **(trimmers)**

Two 20-turn potentiometers set the full scale output levels for the Balanced Outputs only. These are factory preset for full scale with input levels of +14dBu. If necessary, adjust with a suitable trim tool or a small flat-bladed screwdriver. Turn clockwise for increased gain. Take care to ensure the stereo outputs remain in balance. The trim range is ±6dB.

AES1 & 2 Digital Inputs **3 pin XLR female (2 off)**

Two AES/EBU inputs which may be used independently.

On the ***dCS 952***, **AES1** and **AES2** may be used together as a **Dual AES** pair at sample rates of 88.2 or 96kS/s.

SDIF-2 CH1, CH2 Data **BNC (2 off)**

These inputs are for SDIF-2 encoded PCM. They accept TTL level signals from a 75Ω line.

SDIF-2 Clk In **BNC**

SDIF-2 Clk Out **BNC**

This pair take in and give out Word Clock. The functions are set by the menu. **Clk In** is terminated and **Clk Out** is regenerated internally, so these lines can be used for daisy chaining many units together.

Remote **9 pin D type male**

If the Windows™ Remote software is in use, connecting the **Remote** port to a com port on a PC running the Remote Control program allows the unit to be controlled by the PC. In addition, the unit may be software upgraded without removing the lid, by downloading new software via the **Remote** port.

Connect up the Remote port using a 9-way screened cable, fitted with 9-way 'D'-type female connectors at each end, wired pin 1 to pin 1, pin 2 to pin 2, etc. Suitable cables are available from ***dCS***.

Mains Supply **3 pin IEC (CEE22)**

Switched, fused and filtered IEC mains connector.

Additional Information

As well as connectors, the rear panel displays the following information about the unit, near the mains supply connector:

Mains Voltage The actual voltage setting supplied.
Manufacturers name and address

The underside of the unit will have a label on that contains a number such as 952 4B1 6B2 2A1 3A2 12345. This is the serial number, but it also contains vital configuration information. We will need this number (all of it) to give you support over the phone, or to ship you software updates.

Front Panel

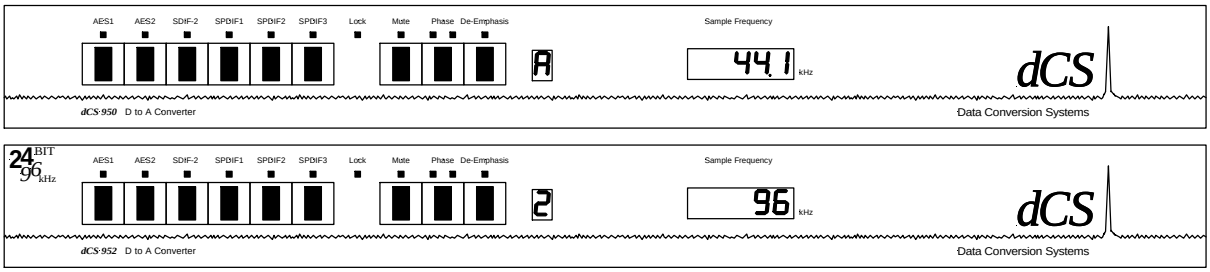

Figure 3 – ***dCS 950*** & ***952*** Front Panels

The ***dCS 950*** & ***952*** use a combination of front panel buttons for frequently changed functions and a step through menu for features you might set and forget.

AES1, AES2, SDIF-2 & SPDIF1 - 3 **Menu Step**

The 6 buttons on the left side of the front panel select the active input(s). The LEDs above these switches indicate the input status as follows:

LED state	**Function**
Bright	Source available and selected. (More than one for Dual AES.)
Dim	Source available but not selected.
Off	Source not available.
Flashing	Source selected but not available.

do this: Connect the source equipment to the unit as necessary. The unit will indicate active inputs by dimly lighting the appropriate LED.

do this: To manually select a single input, press the appropriate button, hold it down for a second then release.

The LED over the button will brighten and the unit will attempt to lock to that input.

dCS 952 only:

do this: For **Dual AES** operation, first connect a **Dual AES** source running at 88.2 or 96kS/s to both **AES1** and **AES2** inputs, ensuring they are the not swapped over. To select the **Dual AES** input, press the **AES1** & **2** buttons together, hold for a second and release **AES2** first.

The two LEDs over the chosen buttons will brighten and the unit will attempt to lock to the **Dual AES** input.

IMPORTANT! *Take care when connecting Dual AES as it is easy to connect the wires in the wrong order. If there is no messaging in the data stream, the only indication that this has happened is poor audio quality. Labelling the cables is a sensible precaution.*

IMPORTANT! *If the selected AES format does not match the source(s) connected to* **AES1** *&* **2***, the audio output may be severely aliased mono or aliased mono mixes of the sources. This should pose no risk to ears or speakers (assuming the system gain is set sensibly) but cannot be detected by the unit without correct messaging.*

The unit stores the last input selection at power down and re-loads it when power is restored. For example, if the previous setting was **AES1**, the unit will return to this mode at power up, provided the source connected to the **AES1** input is valid. The unit will detect the sample rate present on **AES1** and lock to it.

dCS 952 can automatically select the data format. For details, see the menu option "**I-For**" on page 22.

The "**Active Input**" button is the source selector button below a bright LED or, if the unit is unlocked, a flashing LED. This button doubles as the menu **Step** button. For Menu operation as the **Step** button, see the section "**The Software – the Menu"** on page 16.

Panel Lock indicator

When lit, this indicates that the front panel controls are locked out to prevent accidental or unauthorised operation. **Panel Lock** is turned on and off using the **"Loc"** menu option, see page 23.

Mute **Menu Set**

The **Mute** button is dual function – on its own, it mutes and unmutes the analogue outputs when the unit is locked to a source. With the other menu buttons, it is the menu **Set** button

The analogue outputs are automatically muted at power up and remain so until lock is achieved, as indicated by the LED above the **Mute** switch. If **"A-Cut"**, page 19, is turned on, the unit will mute automatically if the source data is identified as non-audio.

For Menu operation as the **Set** button, see **"The Software – the Menu"** on page 16.

Phase **Menu Down**

The **Phase** button is triple function – on its own, it reverses the phase of the analogue outputs. If the "**Panel**" option, page 23. is set to **Volume,** it functions as the Volume down button. With the other menu buttons, it is the menu **Down** button.

The left hand LED above the **Phase** button lights if **CH1(L)** outputs are inverted, the right hand LED lights if **CH2(R)** outputs are inverted. Pressing the **Phase** button toggles both channels between absolute and inverted phase. Holding the button down causes the unit to cycle through the following sequence:

LEDs		Ch1 (L) phase	Ch2 (R) phase
on	off	inverted	absolute
off	on	absolute	inverted
off	off	absolute	absolute
on	on	inverted	inverted

Table 1 - Phase LEDs and Channel Phasing

Release the button when the required setting appears.

For Menu operation as the **Down** button, see **"The Software – the Menu"** on page 16.

De-Emphasis **Menu Up**

The **De-Emphasis** button is also triple function – on its own, it sets the De-Emphasis characteristic. If the "**Panel**" option, page 23. is set to **Volume,** it functions as the Volume up button. With the other menu buttons, it is the menu **Up** button.

De-Emphasis is available for 32, 44.1 and 48kHz sample rates only. Pressing the button repeatedly causes the single digit **Mode** display to the right of the button to cycle through the following options:

Display	De-Emphasis in Use (low sample rates)
A	Automatic - the unit automatically implements the De-Emphasis characteristic coded in the data stream. The display changes to 5 or C when De-Emphasis is automatically applied.
5	The unit implements 50/15µs De-Emphasis.
C	The unit implements CCITT J17 De-Emphasis.
-	De-Emphasis disabled.

Table 2 - Emphasis Indication, low sample rates

dCS recommend setting the unit to **A**utomatic unless there is an error in the De-Emphasis message in the incoming data stream.

For Menu operation as the **Down** button, see the section "**The Software – the Menu"** on page 16.

Mode Display

At sample rates over 48kS/s (***dCS 952*** only), the single digit LED **Mode** display to the right of the **De-Emphasis** button shows the input format:

Display	Input Format
1	Single AES
2	Dual AES

Table 3 - Output Data format indication, higher sample rates

Sample Rate Display

The main display generally shows the incoming sample rate, in kS/s. When other parameters are set, it briefly shows the new setting (volume, tone frequency, etc) then reverts to its normal display. In the case of an error condition, it will display an error message.

If the unit is being slaved to a reference source, the display also indicates which reference input it is slaved to.

xxx	The sample rate, in kS/s (32, 44.1, 48, 88.2 or 96).
b xxx	Slaved to the BNC **Word Clock In**.
d xxx	Temporary display during locking – the unit has detected the base reference sample rate and is attempting to lock to it.
. xxx	Temporary display during locking – the unit is lining up word clock out to word clock in.

Important error messages are given below – a full list is given in the section **"Error Codes and Messages"** on page 48.

BadFs	The clock source is not in pull in range, or is poorly formatted. The unit cannot lock to it.
Err.xy	An error has been detected. Please refer to **"Internal Device Error Codes"** on page 48 for more specific details on error codes.
Hot	The unit is overheating, probably due to inadequate ventilation. Please check positioning and cooling.
Ouch	The "Hot" warning has been ignored and the unit is getting so hot that damage may follow.
(blank)	If the display is completely blank for any significant period, try switching off for 10 seconds then switching on again. If this does not solve the problem, contact your distributor or *dCS*.

The display is also used for **Menu** options.

THE SOFTWARE – THE MENU

Overview

The ***dCS 950 / 952*** has many other functions that either need to be accessed only occasionally, or are informative in nature. These functions can be accessed either by the Remote software, running on a PC and connected to the unit by an RS-232 link - or (in most cases) by the **Menu** via the front panel. If a function is set by the menu or the Remote, the unit remembers it, and it will be set this way for ever (or until you set it to something different). You can customise your unit in this way. Information-only items are displayed for a time, then the display reverts to normal.

Four buttons are used to operate the menu:

Step	otherwise the **Active Input**. This is the input selector button with the bright LED or the one furthest to the left if more than one is bright.
Set	otherwise **Mute**
Down	otherwise **Phase**
Up	otherwise **De-Emphasis**

Entering the Menu

The Menu is entered by holding down the **Step** and then pressing the **Set** button once. The display will show:

F u n c

You are now in the menu, and the menu buttons now have their alternate meanings.

Moving through the Menu

Press the **Step** button again to step through the Menu items listed below. When you reach the required item, press the **Set** button to view or change its setting. This either displays the current state, or changes to the next state, or causes an information function to read out, or enters a lower level (as in the Tone generator, for example). If you have entered a lower level, pressing **Step** steps through its options. When you reach the one you want, press **Set** and then use the **Up** or **Down** buttons to increase or decrease a value (such as **Level** or **Frequency** on the Tone Generator).

If no changes are made in 5 seconds, the unit exits the Menu. When one item has been set, press the **Step** button again if you wish to continue cycling through the Menu.

There is a knack in doing this easily – once it has been gained, it becomes very easy to use the functions it accesses.

The Menu Sequence

To access the Function Menu, hold down the **Menu Step** button and press the **Menu Set (Mute)** button.
(The **Menu Step** button corresponds to the selected input - LED bright or flashing.)
To step through the Menu items, press the **Menu Step** button repeatedly.
To select an item or one of its options, press the **Menu Set (Mute)** button.
Use **Menu Up (De-Emphasis)** and **Menu Down (Phase)** buttons to alter **RS232** address, Tone **Level** and Tone **Frequency**.
To exit the Function Menu, either select the **End** item or wait five seconds.

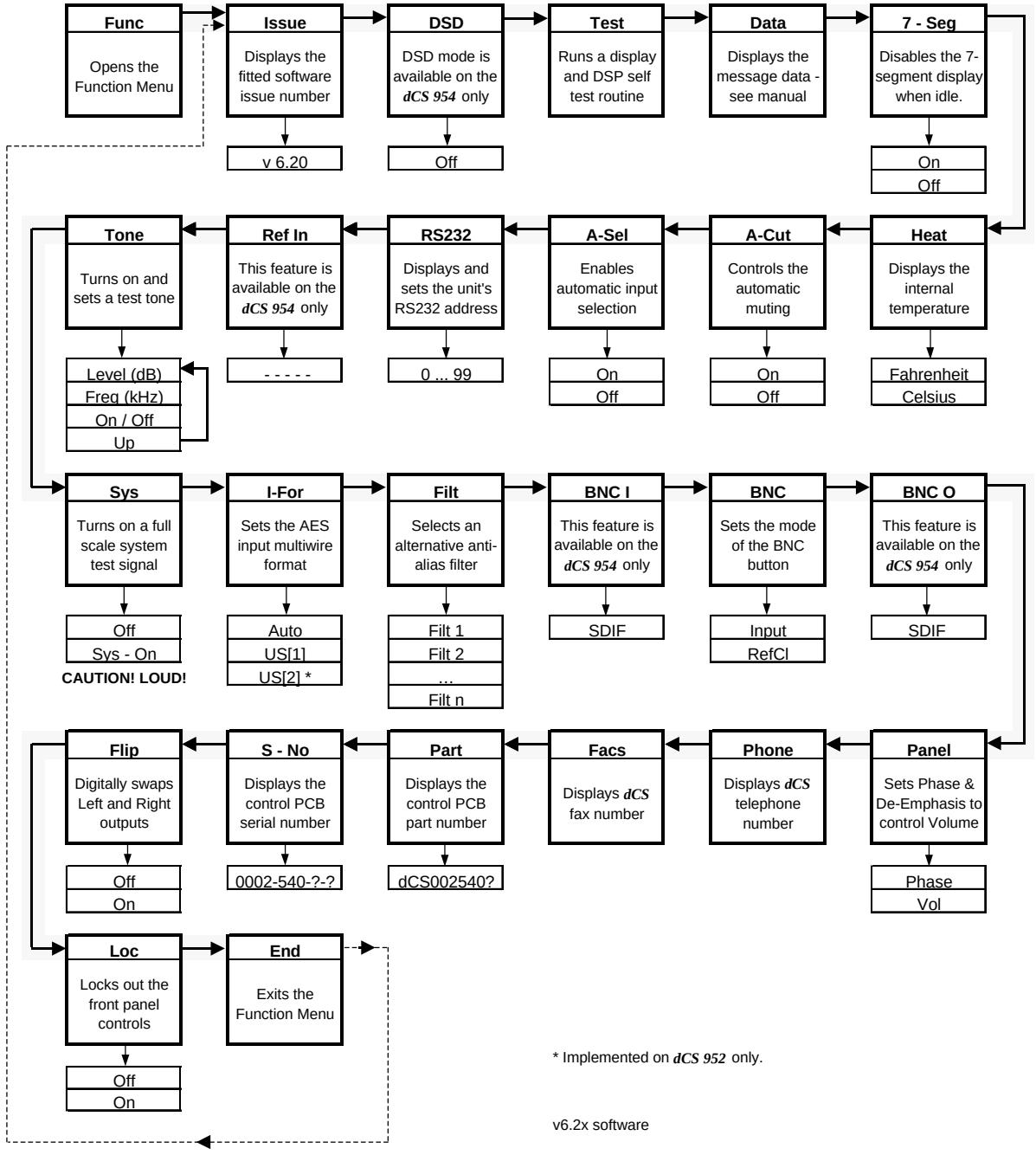

Figure 4 – Menu Sequence

Menu Items

Issue

Displays the software issue when **Set** is pressed.

DSD

DSD mode is available on the ***dCS 954*** only. This feature is permanently set to Off.

Test

Runs a display self test routine. When successfully completed, the unit displays Pass and returns to normal operation. Otherwise an error message Err.xy is displayed – please refer to **"Error Codes and Messages"** on page 48 for more specific information.

Data

Reads and displays the message information from an incoming AES/EBU data stream. This provides a simple access to the digital audio message bits for reference or to assist with system debugging. There are separate data sets for Professional and Consumer streams - the unit reads the incoming stream and decides which it is. Pressing **Set** again steps through the message fields (see the Appendix for a fuller listing of what these are):

First field

Pro	Professional use channel status block, or ...
Con	Consumer use channel status block.

Second field

Audio	Audio data, or ...
n.Aud	Non-audio data.

Third field

N Ind	Emphasis not indicated, or...
None	No emphasis, or ...
50 15	50/15µs emphasis, or ...
J. 17	CCITT J.17 emphasis, or ...
D ----	Unable to decode emphasis, or ...
CPY P	Copy prohibit, or ...
CPY E	Copy enable.

Fourth field

Exxxx	Encoded sample rate is "xxxx", i.e. 32, 44.1, 48, 88.2 or 96. Non-***dCS*** equipment may only decode the first 3 options. or ...
E----	Unknown encoded sample rate.

Fifth field

O.xxxx	Channel origin (alphanumeric), or ...
NonE	Emphasis not indicated, or...
50 15	50/15µs emphasis, or ...
D ----	Unable to decode emphasis.

Sixth field

D.xxxx	Channel destination (alphanumeric), or ...
Cd	CD source, or ...
Enc	2-channel encoder / decoder, or ...
dAt	DAT machine, or ...
S----	Unknown source.

7-Seg

Disables the main 7 segment LED display. When set to Off, the Sample Rate display turns off 5 seconds after the last button press. A dot in the lower right hand corner of the display remains lit to indicate that the display has been deliberately blanked. The display springs back into life (temporarily) if the menu is used subsequently. Error or warning messages are displayed regardless of this setting. The Mode display is not affected.

Heat

Displays the internal temperature of the unit. Press **Set** to toggle between Fahrenheit and Celsius.

A-Cut

Automatically mutes the analogue outputs if the selected AES/EBU data stream is flagged as Non Audio. This gives useful protection and should normally be set to On. Set to Off to disable Auto-Muting. To warn you of this, the Mute LED will flash when the unit is not muted.

IMPORTANT! *Auto-Muting must not be disabled unless absolutely necessary as this will prevent the unit muting if data errors occur or a non-audio CD is played. Monitoring such data can cause loudspeaker and hearing damage!*

A-Sel

When set to On, automatic input selection is active. The unit will detect the inputs connected to an active source and select one in the priority order **AES1, AES2, SDIF-2, SPDIF1, SPDIF2, SPDIF3**. If the selected input is disconnected or turned off, the unit will select the active input with the highest priority. You can select a different input by pressing the appropriate button.

If the **"I-For"** menu item (see page 22) is set to Auto, the unit will read the multi-wire format from the message flags in the AES3 data streams, selecting Dual AES as necessary (***dCS 952*** only). If the message flags are incorrectly set, the unit may set the wrong multi-wire format.

If **I-For** is set to Single (US[1]) or Dual AES format (US[2]), the unit will ignore the message flags and select the AES inputs accordingly.

Set A-Sel to Off to disable automatic input selection.

RS232

Displays - and allows access to – the unit's RS-232 identity code (an address between 0 and 99). This is used by the remote control software to send specific messages to specific units. Use **Up** and **Down** to change this address if you are operating several units in a multichannel set up.

Ref In

This feature is available on the ***dCS 954*** only.

Tone

This accesses a Tone Generator, whose level and frequency can be adjusted. Pressing **Set** enters a submenu, which accesses the following functions:

Level	The output level in dB0. It can be changed in 0.1dB steps using the **Up** and **Down** buttons. Press **Set** to accept the change. The rate of change accelerates if the button is held down. The range is from 0dB0 to –120dB0.
Freq	The output frequency, in kHz. It can be changed by using the **Up** and **Down** buttons. Press **Set** to accept the change. The rate of change accelerates if the button is held down. The step size becomes progressively smaller below 1kHz.
On/Off	Toggles whether the Generator is On or Off.
Up	Allows the menu to be re-entered to set other functions. Alternatively, if left, the menu will just time out, keeping the last settings.

The frequency range is from 1Hz to 99kHz but the level rolls off at the extremes, due to anti-image filters in the analogue circuitry. The Generator output level is less than 0.1dB down from below 10Hz up to 50kHz.

The Tone Generator will work without a digital input. If locked, the unit will be unlocked when the Generator is turned on. At power up, the Generator is always set to Off, 1kHz and –18dB0 – this is a safety measure.

IMPORTANT! *To avoid damage to your ears, loudspeakers and power amplifiers, use the Tone Generator with care .*

Sys

System phase check. This turns on a full-scale test signal for checking absolute output phase on an oscilloscope.

IMPORTANT! *To avoid damage to your ears, loudspeakers and power amplifiers, use the* Sys *option with care . Turn your system volume level well down before using this feature!*

Turn this option On, the display will flash Sys On and the waveforms shown below will appear on the analogue outputs. The top waveform is from the left channel, the bottom is from the right.

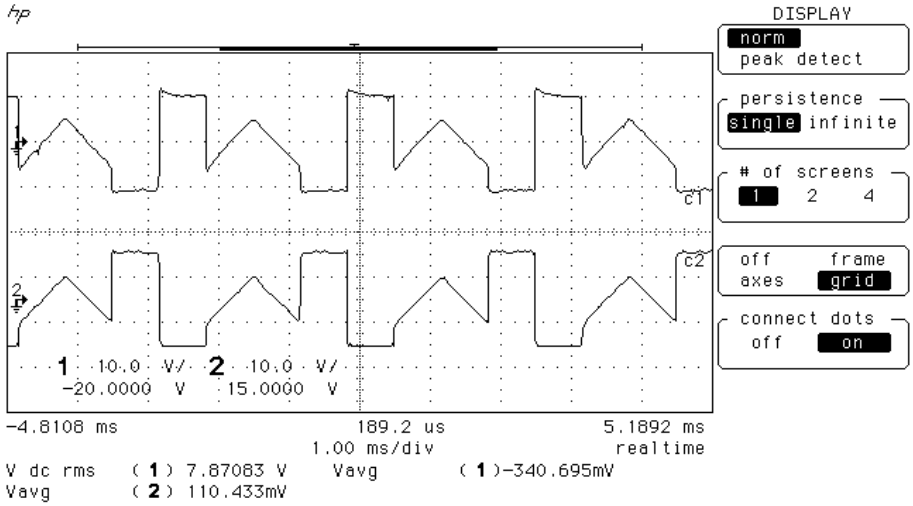

Figure 5 – In-phase Sys waveform

Referring to Figure 5, if the triangular sections point up, that channel is in phase. A triangular section pointing up with a rectangular block on its left side indicates left channel. A rectangular block on the right indicates right channel.

Figure 6 shows the waveforms with both channels inverted.

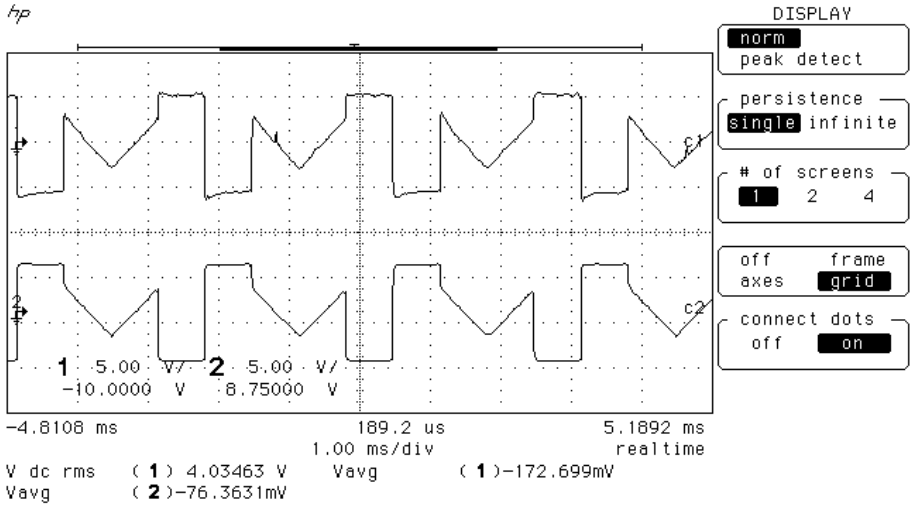

Figure 6 – Out-of-phase Sys waveform

These waveforms are not affected by the setting of the **Phase** button. Set Sys to Off when you have finished checking. Sys is turned off at power down.

I-For

Sets the AES multi-wire **I**nput **For**mat. As ***dCS 950*** does not feature multi-wire interfaces, it has 2 options which are essentially the same:

Auto	The message flags on the selected input are checked and the format is automatically set to Single AES.
US[1]	User-selected Single AES mode.

dCS 952 has 3 options:

Auto	The message flags on the selected input are checked and the format is automatically set to Single or Dual AES. A Dual AES source must be correctly connected to **AES 1** & **2**.
US[1]	User-selected Single AES mode.
US[2]	User-selected Dual AES mode.

In Dual AES mode, the unit will warn you of missing wires with a display like **1-** (**AES2** not connected). Swapped wires are displayed as **21** (**AES1** & **2** swapped). The checking relies on correct messaging and may not work with non-***dCS*** equipment.

You can over-ride any setting using the **Input Selector** buttons.

Filt

Selects one of several anti-image[3] filter responses. The filters should be evaluated by ear. Filt1 gives the sharpest cut off, just below half the sampling frequency. This is the normal setting. Filt2, Filt3, Filt4 give progressively more relaxed responses, slightly degrading the Nyquist image performance but sharpening the impulse response. This affects the stereo or multi-channel image. Different filters may be appropriate for different material.

A typical audio signal contains very little signal energy above 10kHz, so there is some justification for relaxing the filter attenuation as 20kHz is approached, especially at higher sample rates.

The unit stores a different Filter setting for each sample rate.

BNC I

This feature is available on the ***dCS 954*** only – it is permanently set to SDIF.

[3] Nyquist images, not stereo images. These are reflections of the pass-band spectrum about Fs/2 caused by any digital-to-analogue conversion process. They must be filtered out by the converter.

BNC

This controls the operation of the **SDIF-2** button.

Input	Configures the **BNC** input connectors as a data input. Press the **SDIF-2** button to select it.
RefCl	Configures the BNC **Word Clock In** connector as a reference clock input. Press the **SDIF-2** button to sync the unit to an external SDIF-2 Word clock while taking data from the AES or SPDIF inputs. The SDIF-2 LED will light, in addition to the LED(s) for the data source. Press the **SDIF-2** button again to sync to the data input instead.

BNC O

This feature is available on the ***dCS 954*** only – it is permanently set to SDIF.

Panel

Sets the operation of the **Phase** and **De-Emphasis** buttons.

Phase	Sets the two buttons to their standard functions.
Vol	The two buttons act as a digital volume control. **Phase** reduces the **Volume** in 0.1dB steps, while **De-Emphasis** increases the **Volume**. The change accelerates if a button is held down. The range is 0dB to –20dB.

Phone

dCS telephone number scrolls across the display.

Facs

dCS fax number scrolls across the display

Part

The control board part number (version) scrolls along the display.

S-No

The control board serial number scrolls along the display. You will need something to write this on, if you call us for help.

Flip

Normally set to Off. If you find the Left and Right outputs from your system are reversed due to a connection error, set Flip to On to digitally swap them back. The main display shows Flipd while this feature is turned on. Flip is not stored at power down so you should correct the error and turn Flip Off.

Loc

Front panel Lock, normally Off. Set to On to prevent unauthorised changes using the front panel buttons. The menu has to be accessed in the usual way to turn the lock off again.

End

Exits the menu.

TYPICAL APPLICATIONS

Using a Master Clock to Sync a *dCS 950* or *952*

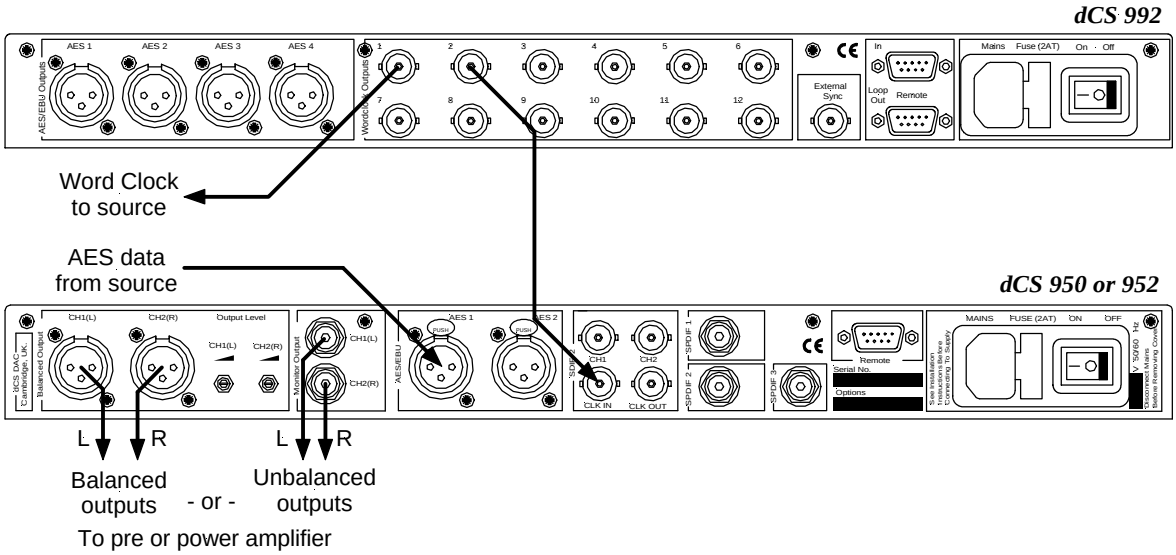

Figure 7 – Syncing to a Master Clock

do this: Set the ***dCS 992*** Master Clock to the same sample rate as the source.
do this: Set up the ***dCS 950*** or ***952*** as follows:
Set BNC in the menu to RefCl.
Select the required input (**AES1** if connected as shown above).
Press the **SDIF-2** button as well to sync to the Master Clock.

To use an SDIF-2 source with a Master Clock:

do this: Set the ***dCS 992*** Master Clock to the same sample rate as the source.
do this: Set up the ***dCS 950*** or ***952*** as follows:
Set BNC in the menu to Input.
Connect the source to the SDIF **Ch1** & **Ch2** inputs.
Connect the Master Clock to **Clk In**.
Press the **SDIF-2** button.

Upsampling a CD player

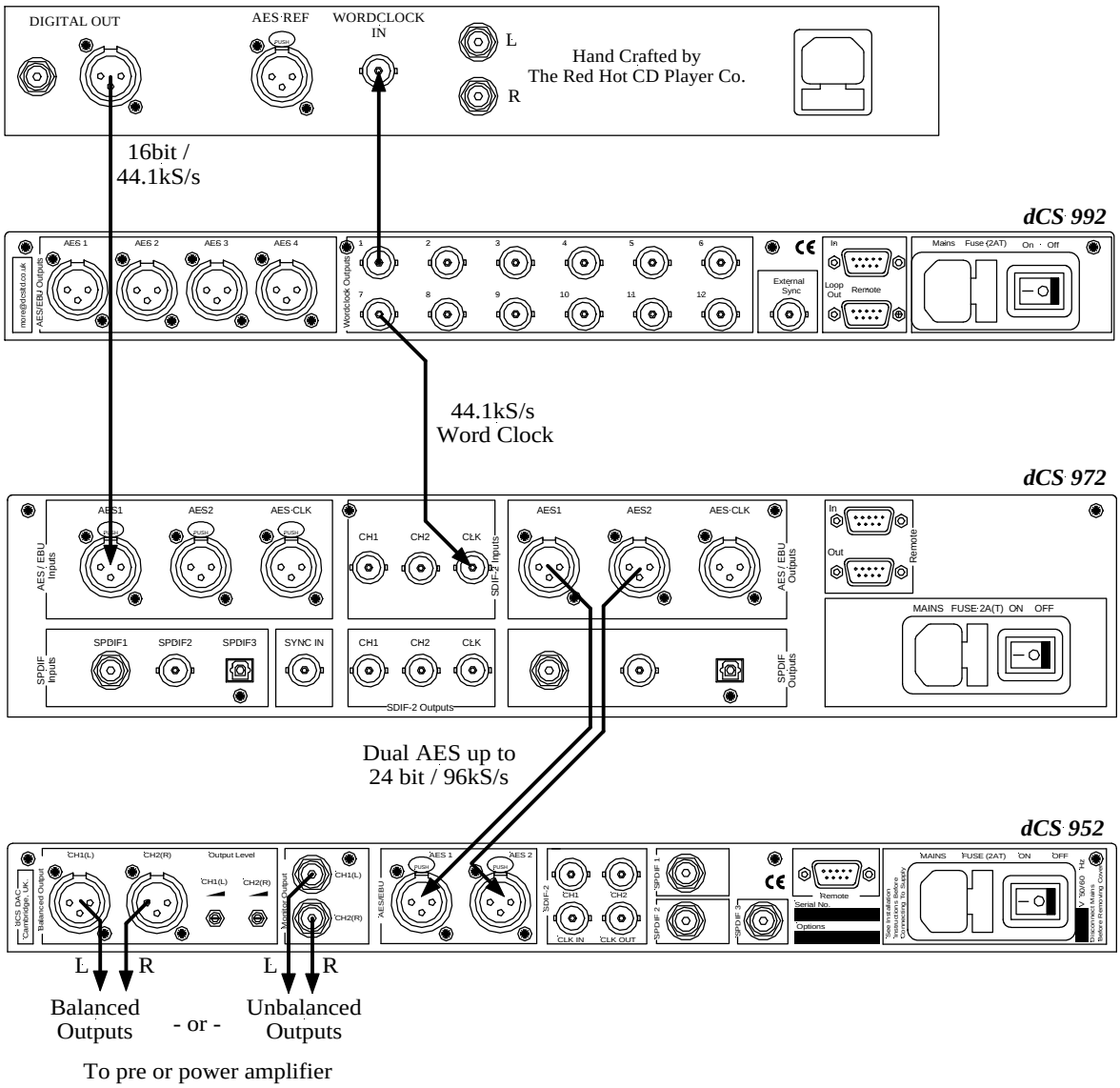

Figure 8 – Upsampling a CD to 24 bit / 96kS/s

do this: Set the ***dCS 992*** to 44.1kS/s.

do this: Set the ***dCS 972*** Input Frequency to Auto, Output Frequency to 96kS/s, Output Mode to Dual AES, Sync Source to Word Clock.

do this: Set the ***dCS 952*** to Dual AES on **AES1** & **2**, **Mute** to **Off** and select a filter.

IMPORTANT! *DO NOT lock the **dCS 952** to the **dCS 992** or the audio output will be full scale noise!*

The Master Clock is optional – it helps reduce jitter. If you don't have a Master Clock, you can slave the ***dCS 972*** to the CD player by setting Sync Source to Audio Input.

Replaying 24/96 from a Nagra-D recorder

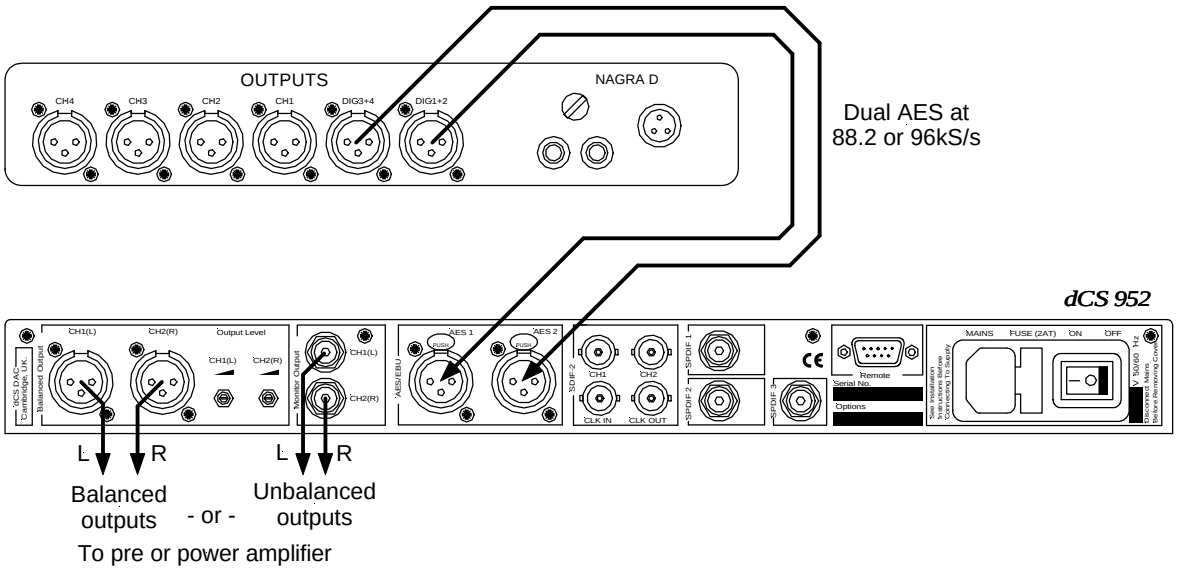

Figure 9 – Replaying 24/96 from a Nagra-D recorder.

do this: Set the I-For menu item to US[2]. Connect up as shown, set the recorder in Play mode and press **AES1** to select the Dual AES pair.

Six Channel Set Up

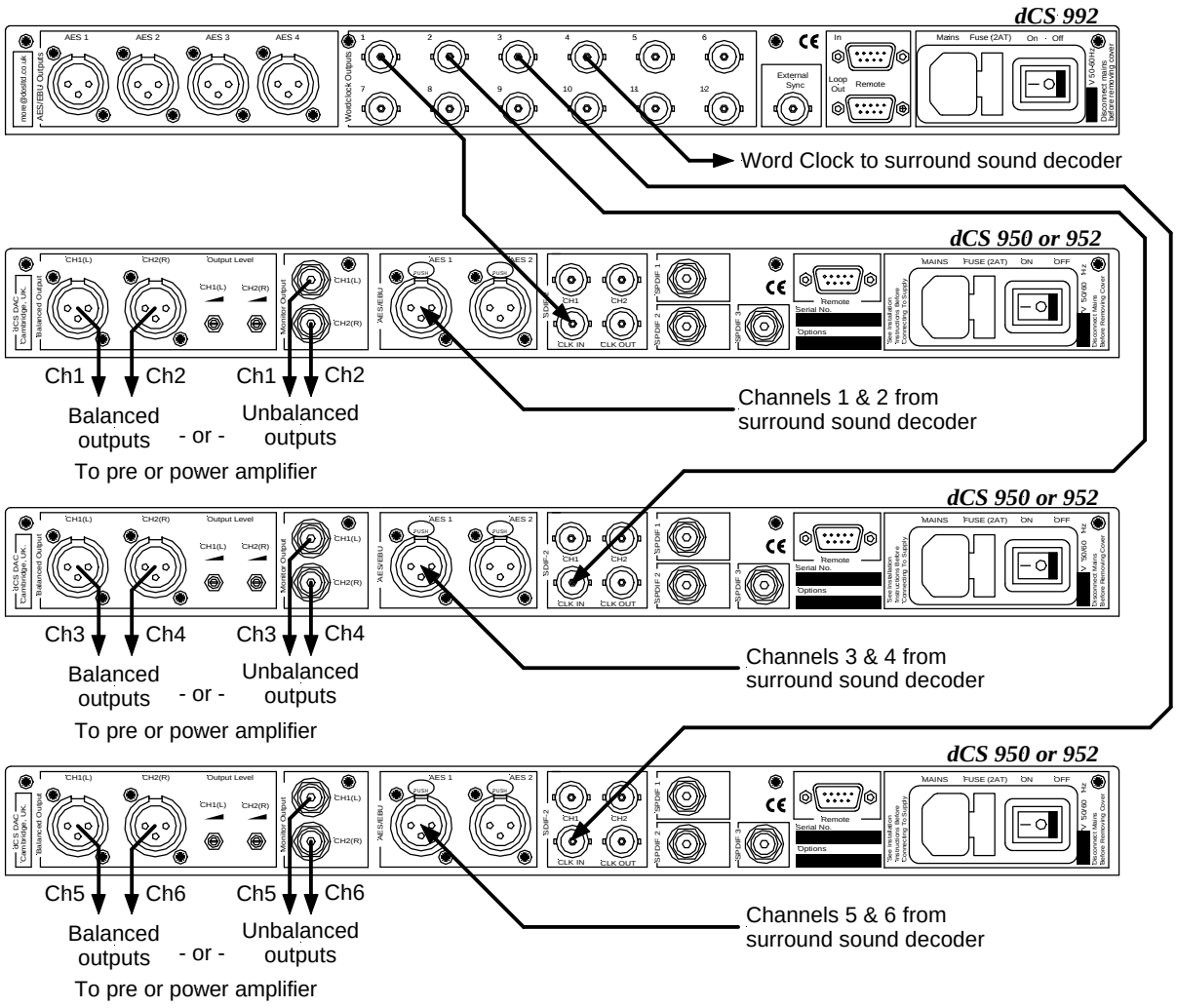

Figure 10 – Six Channel Set Up

The ***dCS 992*** Master Clock is optional – it helps reduce jitter.

do this: Set the ***dCS 992*** Master Clock to the same sample rate as the source (probably 44.1kS/s) and lock the source to the Master Clock.

do this: Set up the ***dCS 950*** or ***952*** as follows:

Set BNC in the menu to RefCl.
Select the required input (**AES1** if connected as shown above).
Press the **SDIF-2** button as well to sync to the Master Clock.

One of the SPDIF inputs or the SDIF-2 input on each unit may be used instead of the AES1 inputs.

If three ***dCS 952***'s are used, the source can be three 88.2 or 96kS/s feeds, or even three Dual AES feeds.

A / B Comparisons

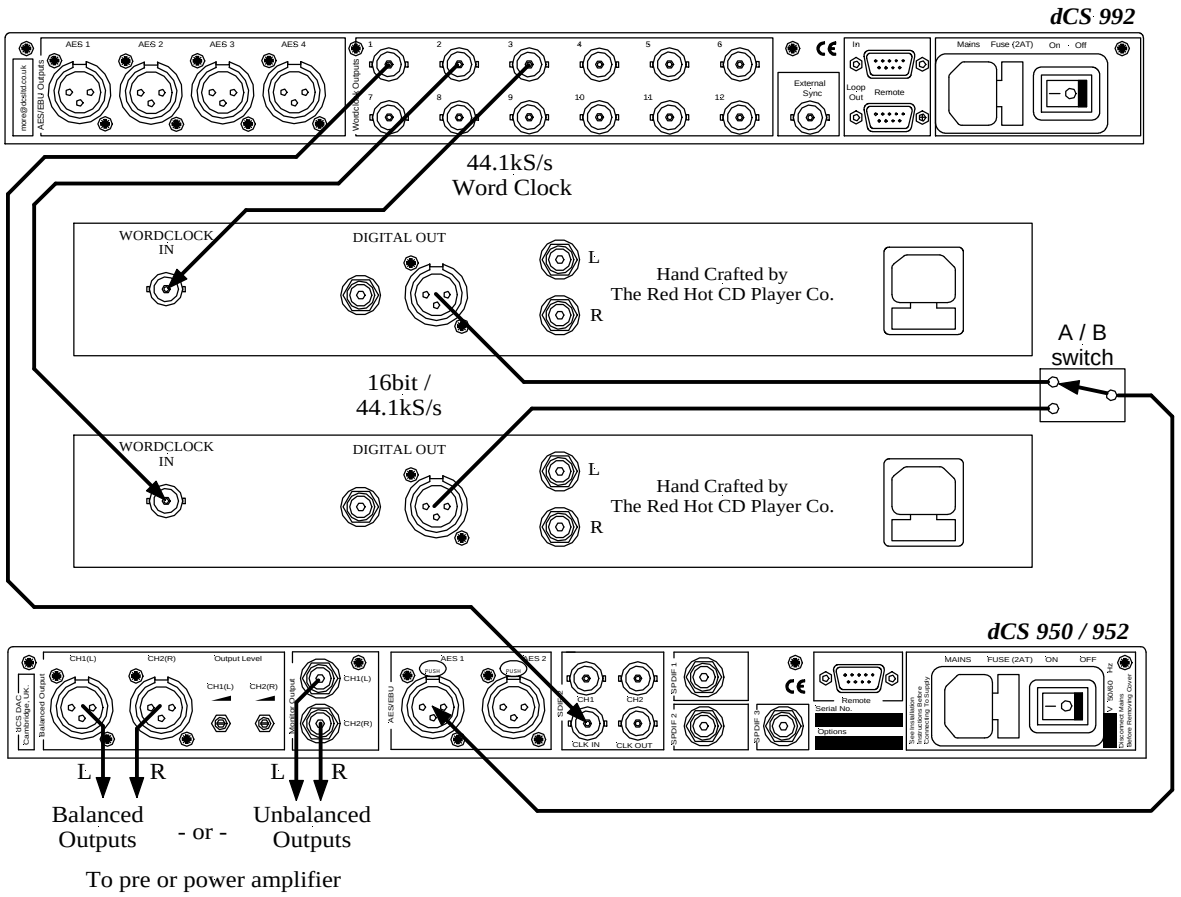

Figure 11 – Performing A / B Comparisons

Two digital sources such as CD players may be compared nearly seamlessly using the set up above.

do this: Both CD players and the ***dCS 950 / 952*** MUST be locked to the Master Clock.

The A / B switch (or relay) MUST change-over within 10ms with minimal contact bounce to avoid loud clicks and prevent the DAC muting. An ordinary miniature toggle switch with gold-plated contacts was used during development. This set up has been checked at sample rates up to 96kS/s.

IMPORTANT! *Selection of a suitable switch or relay is the responsibility of the user. It may be necessary to replace the switch occasionally due to mechanical wear.*

dCS 950 / 952 TECHNICAL INFORMATION

Anti Image Filtering

The ***dCS 950 / 952*** offer a choice of 4 anti-image filters on all sample rates. These filters affect the ultrasonic part of the spectrum - 20 kHz upwards.

The unit is a DAC, with an output data rate set by the interface standard used. The bandwidth of the oversampling converter used is high, and so any signals that are in the input data will produce Nyquist images[4] in the output signal if they are not removed by filtering. The demands on this anti-image filter can be quite severe at the lower ("normal") sample rates - it must pass signals in the audio band (0 - 20 kHz) unimpaired, but it must remove images above Fs/2. This can result in a very sharp filter, and it is an unavoidable mathematical result that sharp filters have a poor, ringing, transient response. One effect of the ringing is to spread the energy in a transient over a significant period of time (it can be up to 1 ms). This seems to affect the stereo image that the ear would otherwise form.

One can trade off filter roll-off and energy smear - more relaxed roll-off gives less energy smear, but it may allow some of the signals in the input data to form audible images in the output signal. A signal containing Nyquist images can be corrected only by applying a sharp low-pass filter. However, as far as the ear is concerned, this may not matter. The ear can tell the frequency of a signal - up to a point. As the frequency rises, the accuracy with which the ear can tell what the frequency is decreases, and above a limit, all the ear can tell is that there is a signal, and it is above ... kHz. It can tell no more. So - it may be that a small amount of Nyquist imaging is acceptable to the ear.

The filters that we have included give increasingly good energy smear performance, and consequently have increasingly relaxed roll off. FiLT1 gives the sharpest roll off, with no Nyquist images, but the worst energy smear. Then as the number increases the smear decreases, but the imaging increases. Try them, to see which you prefer.

You may find that for different material, different filters are appropriate - and you may find that for different stages in the recording and mastering process, different filters are appropriate.

Our users tell us that they find the ability to select different anti-image filters very useful. Generally for classical music, number 2 is preferred while 3 & 4 are popular with users recording rock and jazz. Opinions differ widely – so try them for yourself.

The ***dCS 950 / 952*** uses linear phase FIR filters to avoid the limit cycle problems that come with many IIR filters. Linear phase gives filters a symmetrical transient response before and after a transient ("pre-ringing"). The passband may or may not have a ripple[5], depending on the filter being used. The stop band is typically below –110dB0 and can be as low as –130dB0.

[4] See, for example "Principles of Digital Audio", 3rd Edition, by Ken C Pohlmann (McGraw-Hill Inc, 1995)
[5] Filters always have some ripple. For "zero ripple" filters this is in the µdB to pdB region.

Clocking

The sample clock quality significantly determines the performance of a DAC.

The highest quality clocks that are available are crystals, so we use these. The ***dCS 950 / 952*** uses one of two on-board voltage controlled crystal oscillators (VCXOs) as a clock source – one for 48 kS/s related outputs and one for 44.1 kS/s related outputs. When the unit is slaved to an external source, the appropriate VCXO is selected and synchronised to this by a phase locked loop (PLL). The PLL is of a special narrow bandwidth type, that provides a high degree of "clock cleaning" - but even so, signal quality may degrade if particularly poor source clocks are used. A consequence of the narrow bandwidth is that it takes quite a long time for the PLL to lock to a new clock frequency – of the order of 2 seconds. The PLL uses DSP assistance to keep this time acceptable.

Synchronising to source

Pull in range	> ± 300 ppm about nominal frequency
Lock in time	< 2 seconds for most situations

The PLL is very robust, and will lock to very poor signals if necessary. Data is decoded using a much wider band (faster) PLL, so AES3 type low frequency jitter on the input clock can be handled, and will be cleaned.

If you need to synchronise several items of digital equipment, we recommend using a ***dCS 992*** Master Clock.

Sample Alignment

When Word Clock In is used as a sync source, In and Out are related as below. The lower waveform is the output, the upper one is the input. The misalignment is less than about 40ns. The scope shots below were taken with the unit sync'd to Word Clock In.

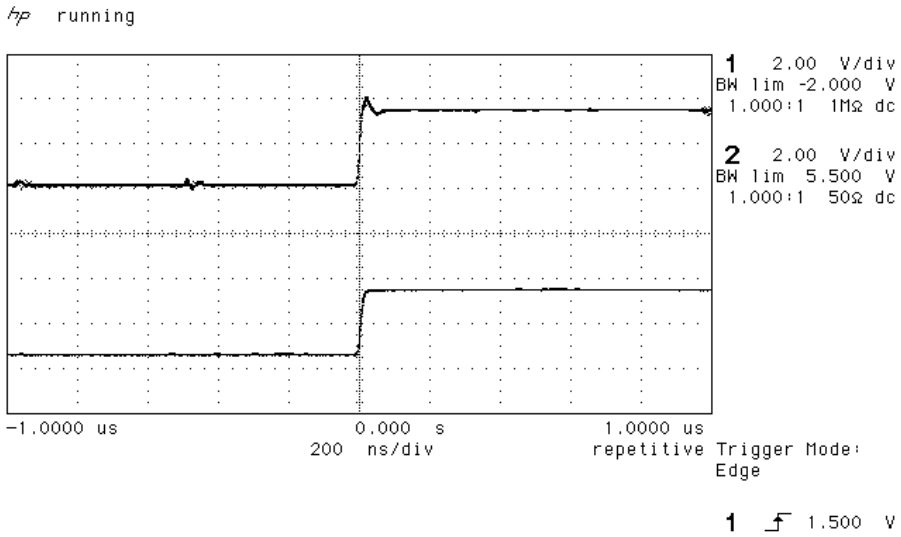

Figure 12 – Word Clock In to Word Clock Out, 96 kS/s

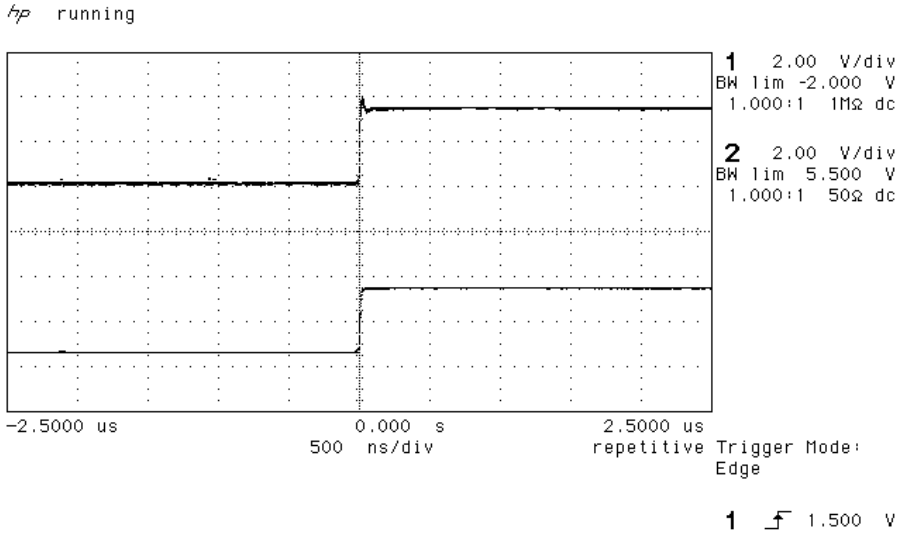

Figure 13 – Word Clock in to Word Clock Out, 44.1 kS/s

Digital Interface Specifications

AES/EBU (AES3)		Input	
Type		*Balanced, differential*	
Impedance		110	Ω
Sensitivity		1 ~ 10	V pk-pk
Maximum Wordlength		24	bits
Damage level		> 20	V pk-pk
Connector		XLR3 female	
Connections	Pin 1	Ground or shield	
	Pin 2	+Signal	
	Pin 3	-Signal	

Table 4 – AES/EBU input specifications

SPDIF (IEC958)	Input	
Type	*Single ended, ground referred*	
Impedance	75	Ω
Sensitivity	0.5	V pk-pk
Maximum Wordlength	24	bits
Damage level	> 20	V pk-pk
Connector	RCA phono	

Table 5 – SPDIF input specifications

SDIF-2	Input	Output	
Type	*Single ended, ground referred*		
Impedance	100	25	Ω
Sensitivity (unloaded)	TTL	TTL	
Maximum Wordlength	24	24	bits
Damage level	> 10		V pk-pk
Time skew			
Word Clock in / out	< 40		ns
Connector	BNC x 3	BNC x 1	
Connections	CH1 (left) CH2 (right) Clk In & Out		

Table 6 – SDIF-2 i/o specifications

Remote control interface	Input
Type	RS-232
Level	RS-232
Data Format	Contact *dCS*
Connector	9 way D type male

Table 7 - Remote Control Interface Details

Analogue Interface Specifications

Balanced Outputs			
Type		Balanced, floating	
Format		AES14 : 1992	
Source Impedance (20Hz - 20kHz)		< 3	Ω
Maximum Load		600	Ω
Noise, unweighted (20Hz – 20kHz)		< -110	dB0
Spurious responses (20Hz - 20kHz)		< -100 -110	dB0 dB0, typ
Signal Balance @	1kHz 50Hz 1kHz 20kHz	> 40 45 53 53	dB, spec dB, typ dB, typ dB, typ
L – R crosstalk (20Hz- 20kHz)		< -100	dB0
Level for Full Scale (as shipped)		+14	dBu
Trim range		±6	dB
Connector type		XLR3 male	
Connections	Pin 1 Pin 2 Pin 3	Ground or shield +Signal -Signal	

Table 8 – Balanced Output Details

Unbalanced Outputs		
Type	Unbalanced, ground referred	
Source Impedance	52	Ω
Maximum Load	600	Ω
Noise, unweighted (20Hz – 20kHz)	< -110	dB0, spec
Spurious responses (20Hz - 20kHz)	< -100	dB0
Level for Full Scale	+8	dBu
Connector type	RCA phono	

Table 9 – Unbalanced Output Details

Frequency Response

The overall frequency response is determined by the sample rate, the digital filter and the analogue filter. All filters must cut-off before Fs/2 is reached, with a margin to allow for sufficient attenuation to be reached to effectively eliminate Nyquist images.

At a sample rate of 44.1kS/s, a flat 20kHz pass band must be maintained with at least 80dB of attenuation above Fs/2 (22.05kHz). This allows barely 2kHz margin between the pass band and the stop band for the filter to do its work, necessitating a very sharp filter.

At sample rates of 88.2kS/s and above, there is so much extra bandwidth available that maintaining a flat 0 - 20kHz audio band is less of a problem. This allows more relaxed filters to be used, resulting in extra sonic benefits.

Frequency responses for all 5 sample rates, set to Filt1, are shown below.

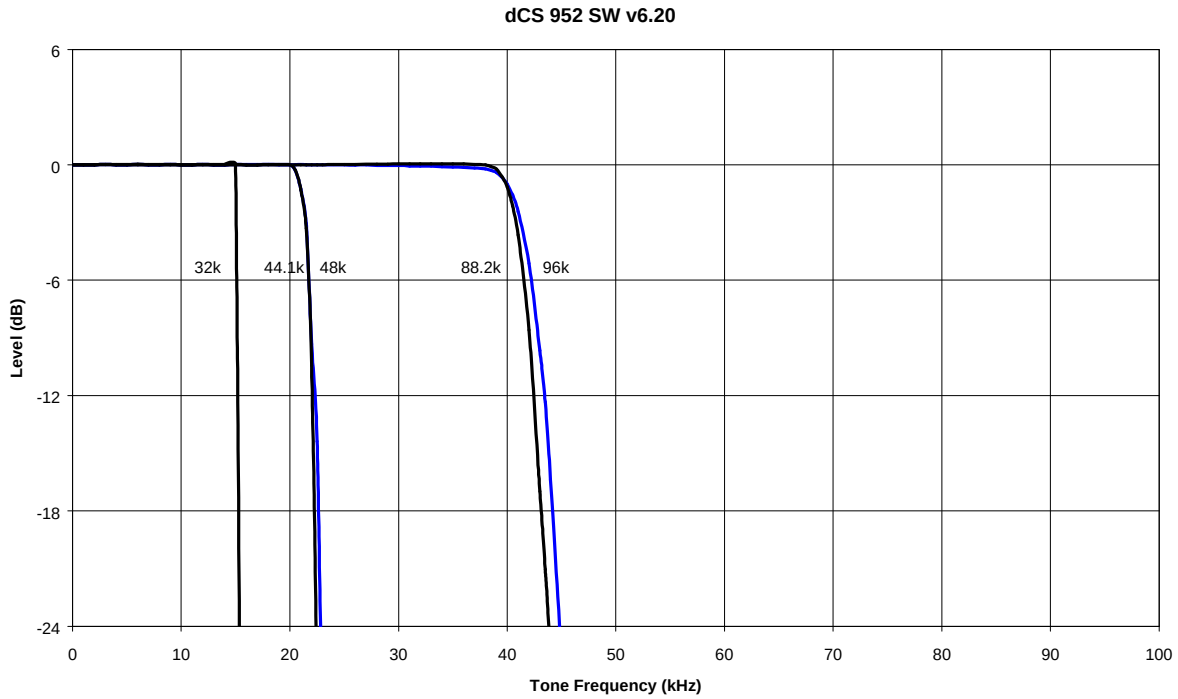

Figure 14 – Filter 1 frequency responses

AES3 (AES/EBU) Format

Message Handling

The AES/EBU interface accepts a data structure that conforms to the ***dCS*** version of AES3-1992. This contains 28 bits of Manchester encoded data, and a 4 bit near-Manchester encoded preamble in a subframe, and subframes are further assembled in a block and frame structure. Each subframe contains:

- preambles, to allow the receiver to sync up
- up to 24 bits of audio data, transmitted lsb first
- V, a validity bit
- U, a user bit, for the "User Message"
- C, a Channel Status bit, for the "System Message"
- P, a parity bit

For more information on the way ***dCS*** implement the AES3 system message to handle higher sample rates, see the Appendix to this manual. For the formal definition of the AES3 interface, see footnote[6], from the AES.

How Far will AES3 Go?

The AES/EBU format was designed to go reasonable distances, at 44.1 kS/s and 48 kS/s. Figure 15 and Figure 16 below show it over 16 m and 94 m using average cables. The waveform at 94 m can still be decoded, although it is quite degraded. Cable delay is about 5.6 ns/metre.

At 96 kS/s (twice the data rate the format was designed for) the allowed cable length is less. Figure 17 and Figure 18 below show this over 16 m and 94 m. At 16 m the waveforms are still very good, but at 94 m they are really quite unreliable.

We recommend restricting 96 kS/s cable runs to 20 m or less, and using good cable near this length.

[6] AES3-1992 (ANSI S4.40-1992) “AES Recommended practice for digital audio engineering – Serial transmission format for two-channel linearly represented digital audio data”.

Contact *dCS* on + 44 1799 531 999
(inside the UK replace + 44 with 0)
email to: more@dcsltd.co.uk
web site: www.dcsltd.co.uk

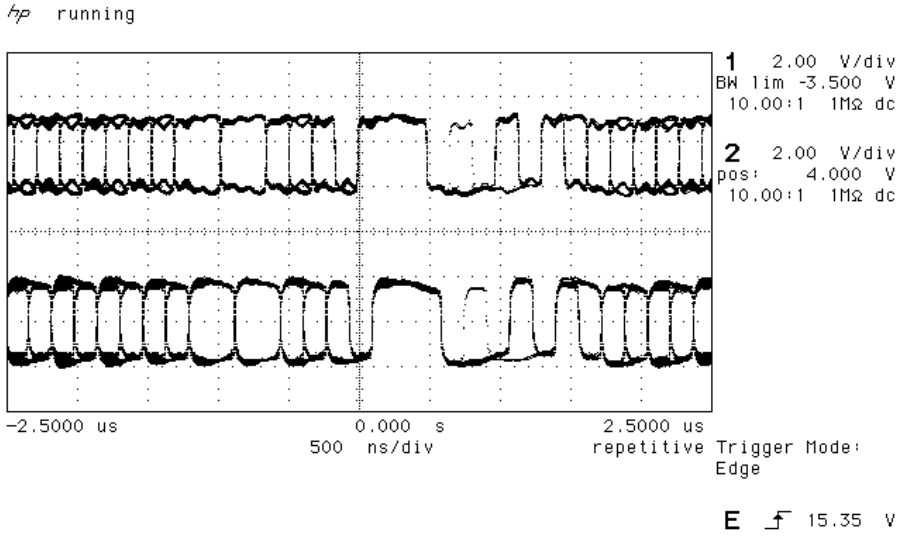

Figure 15 – AES3 format at 48 kS/s over 16 metres

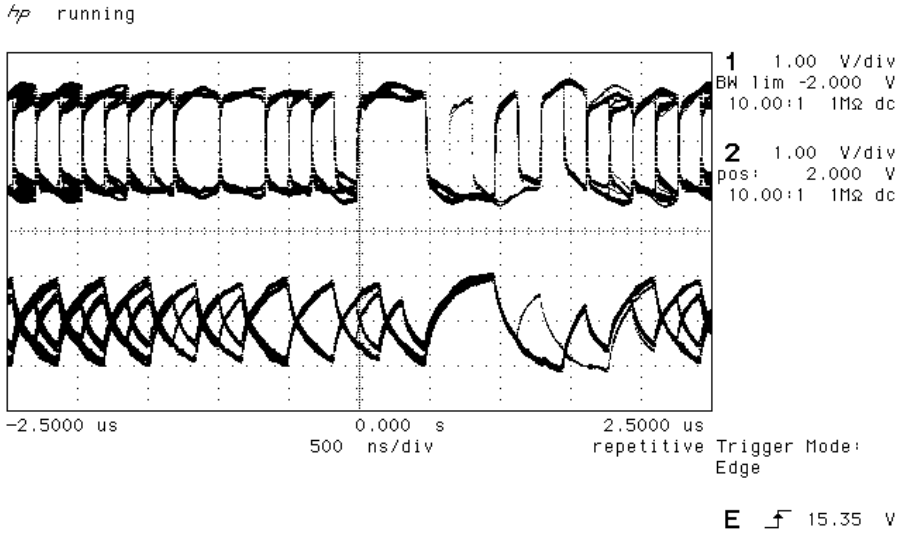

Figure 16 – AES3 format at 48 kS/s over 94 metres

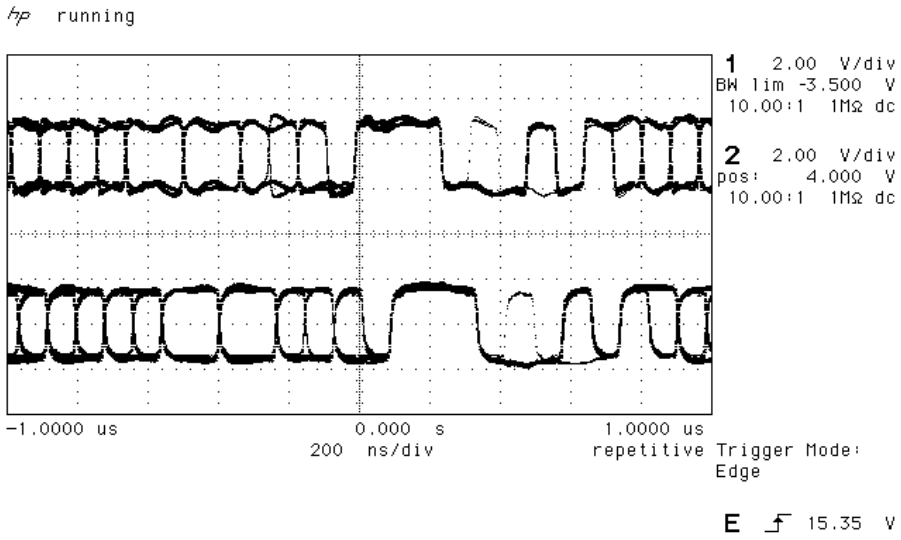

Figure 17 – AES3 format at 96 kS/s over 16 metres

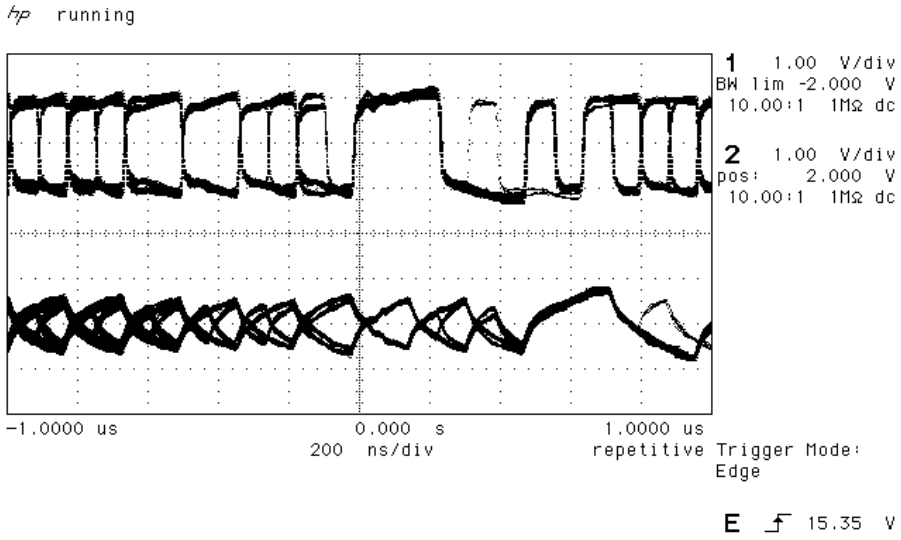

Figure 18 – AES3 format at 96 kS/s over 94 metres

SDIF-2

The SDIF-2 interface is a 4 wire NRZ interface - so the DC level on each signal line may not be constant. It contains 20 bits of audio data and has a block structure of 256 stereo samples, rather than the 192 of AES/EBU. There are 8 bits of message per channel per sample - with a further 3 bits being used for an "illegal code" based sync code. Of the 8 bits per sample, the 8 in the first sample are reserved for system messaging, and the rest are for User messages.

The 4 wires are:

Ground return
Left Channel (Ch1)
Right Channel (Ch2)
Word Clock

The sync codes can enable data recovery without the word clock, if necessary, but with the number of data formats in current operation, this method of locking is strongly discouraged. The waveforms below show SDIF-2 waveforms (data and Word Clock) at 44.1 kS/s and 96 kS/s.

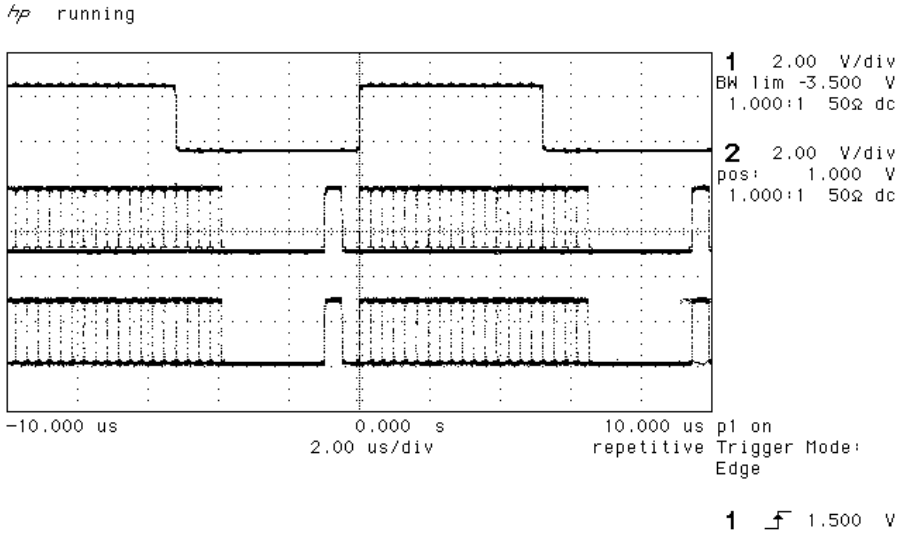

Figure 19 – SDIF-2 format at 96 kS/s

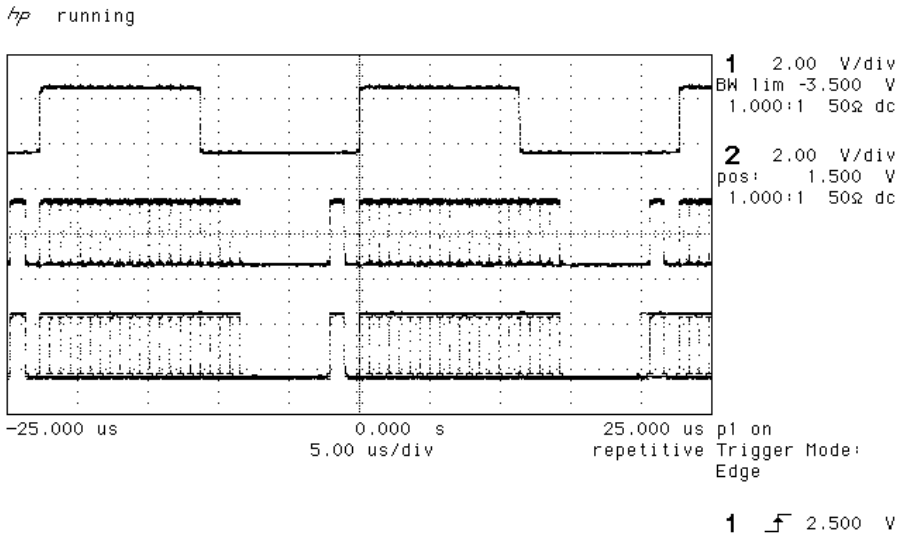

Figure 20 – SDIF-2 format at 44.1 kS/s

SDIF-2 Messaging

The SDIF-2 message details are defined in the table following.

DESCRIPTION	Definition
Undefined	0000 0xxx
Emphasis	
No emphasis	xxxx x00x
Emphasis (15µsec, 50µsec)	xxxx x01x
Dubbing Prohibit	
Dubbing allowed	xxxx xxx0
Dubbing inhibited	xxxx xxx1
Block Code	
Start of block	xxxx xxxx 1...
Not start of block	xxxx xxxx 0...

Table 10 - SDIF-2 Messages

Power Consumption

The ***dCS 950 / 952*** has a linear power supply, and so power consumption changes as the mains voltage changes. The internal regulation is comparatively efficient for a linear supply, so these changes are kept to a minimum. Consumption is independent of mains voltage selector switch setting.

Power Consumption with Mains Voltage (measured as AC power into mains socket):

Nominal mains	28 W
Mains -10%	26 W
Mains +10%	31 W

The actual intended supply voltage is shown on the rear panel. 50Hz or 60Hz operation is not important – the unit can use either. In general, users will not need to change the mains input configuration. If you do need this to be done, please see the section **"Having Your Options Changed"**, page 44 in this manual and contact your distributor or ***dCS***.

Size, Weight and Operating Conditions

Size and Weight

The ***dCS 950 / 952*** dimensions correspond to a standard 2U 19" rack mount case. Four heavy duty feet, fitted to the base, extend the overall height to slightly greater than 2U.

Dimensions

Width	430 mm	see note (i)
Height, without feet	44 mm	(2U)
Height, with feet	52 mm	
Depth	390 mm	see note (ii)
Weight	6.8 kg	see note (iii)

note (i)	Removable 19" rack mount ears are supplied, taking total width to 483 mm (19").
note (ii)	Measured from front panel to rear panel connectors. Additional depth should be allowed to accommodate cable connectors.
note (iii)	The high quality case is necessarily heavy, consideration should be paid to appropriate support shelving when installing the units in a rack.

Operating Conditions

The case of the ***dCS 950 / 952*** has no ventilation slots or fan cooling, to give:

- quiet operation (does not need to be installed in a machine room)
- internal temperature stability
- improved electrical safety
- long term reliability
- no regular maintenance or cleaning requirements

It dissipates relatively low power, so that usually allowing natural convection provides enough cooling. Do not install the unit near heat sources such as radiators, air ducts or direct strong sunlight. Ambient should not exceed 50°C, should not fall below 0°C, and should be a non condensing. If in doubt, the easy test is – the ***dCS 950 / 952*** is happy to work anywhere a human is.

OPTIONS

Mains Voltage

We ship with the mains wired according to the destination. The voltage option should be specified when the unit is ordered, by specifying the country of use. It can be updated later by your dealer, if necessary.

Video Frequency VCXOs

We can fit additional video frequency VCXOs (enabling frequencies such as 44.056kS/s and 47.952kS/s). These are best fitted at ***dCS***, to allow full checking.

P3D, DSD Pro and Other Formats

We can fit larger FPGAs to allow P3D, DSD Pro and other formats. This has to be done at ***dCS***.

Ordering Options For A New Unit

To order any option, just tell us:

dCS 950 for use in <*country*>, with options ….

or:

dCS 952 for use in <*country*>, with options ….

IMPORTANT! *Always specify the intended country of operation, otherwise we will assume that country of delivery is the same as country of operation.*

Having Your Options Changed

dCS support modifications, updates and option changes to supplied units. If you are in any doubt, please contact your Distributor or ***dCS***. In general, these will be carried out at ***dCS***, because we have extensive test facilities and can verify the changes.

IMPORTANT! *Please do not attempt the changes yourself. The unit's performance and reliability may be impaired, and the warranty will be invalidated.*

MAINTENANCE AND SUPPORT

Hardware

Service & Maintenance

dCS audio products are designed not to need regular maintenance, and contain no user serviceable parts:

- there are no moving parts,
- there are no short life or wear-out parts used,
- the units have no holes through which liquids or
- contamination can normally enter,
- no dust deposits build up to degrade performance.

All parts are replaceable or upgradeable by ***dCS***, for a period of at least five years from the date you purchased your unit. If your unit is damaged in some way, please contact your Distributor or ***dCS***.

User Changeable Parts

There are no user serviceable parts inside the case. Routine maintenance is not necessary and repairs are generally carried out by ***dCS***, since this allows us to thoroughly verify the results before shipment.

There is a mains fuse in the mains socket, accessible from the outside of the unit. This may be changed by the user. The current consumption of the unit is very low (260 mA at 115 V) so it only blows if there is a fault - usually if the unit is set to its low voltage setting (100 - 120V) but has been plugged into a high voltage mains (220 - 240V). Usually no other damage is caused, but if the fuse blows repeatedly on replacement, some other damage will have been done and the unit must be returned to ***dCS*** for repair.

Fuse Type : 20 x 5mm 2 amp HRC fuse

If the fuse should fail, it is essential that it be replaced with one of the same type. Failure to do so could result in damage to the unit and may invalidate the guarantee. To gain access to the fuse, remove the IEC mains connector, use a small flat bladed screwdriver to pry up the tab on the fuse carrier and pull it out. Push the fuse out of the clip in the carrier and replace it with a new one. Push the carrier back into the unit so that it clicks home.

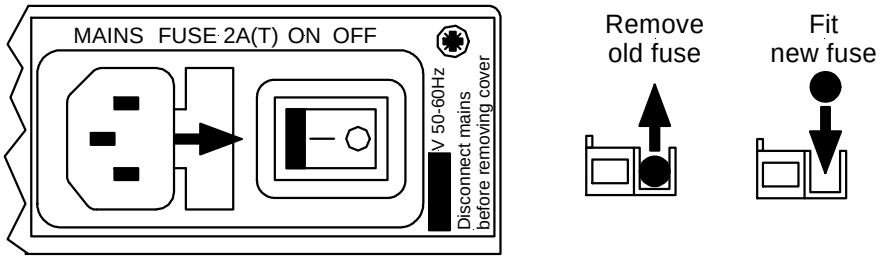

Figure 21 – Changing the Mains Fuse

IMPORTANT! *Disconnect from the mains before changing the fuse.*

Software

Installing New Software

The operating software can be downloaded via the RS-232 link from a PC comm. port, using the Windows Remote software running on the PC.

To use this, follow the installation instructions on the floppy discs the remote software is supplied on. Then, run the remote programme, with whatever units you want connected. The software will scan the RS-232 chain for units (this takes a while) to see what is connected. It then reports back and for each unit there is an info button. This gives you the option of installing new software in that unit.

To find out if there are any software updates available for your equipment, call us, or email us, with your units serial number.

Hardware Update

You may wish to have your unit updated occasionally. ***dCS*** offer this service - we will install any modifications or updates that have occurred since your unit was first shipped and give the unit a full retest to current standards. The price will depend on the hardware changes necessary – so contact your Distributor or us. In order to ensure speedy turn around please contact us prior to returning the unit.

Safety and Electrical Safety

There are no user serviceable parts inside the ***dCS 950 / 952*** and so there is no need to remove the covers. If for some reason you do:

IMPORTANT! *Disconnect from the mains before removing any covers or changing the fuse.*

There are no substances hazardous to health inside the ***dCS 950 / 952***.

TROUBLESHOOTING

Error Codes and Messages

The error codes reported by ***dCS 950 / 952*** provide an effective means to diagnose the majority of problems that may be encountered in use - including problems with the overall system the unit operates in, internal device warnings and internal device failures. Please note that through damage or component failure, the unit self check may fail to operate. If this happens, please contact your distributor or ***dCS*** for assistance.

Internal Device Error Codes

Sometimes the unit may misbehave. If there is an internal reason, an internal device error code may be displayed as follows:

Err.xy an error xy (see table below) has been detected

where xy values have the following meanings:

Code	Description
01	E^2 memory (EEPROM) not present
02	Error initialising DSP
03	Error loading DSP
04	Error initialising DSP for coefficients
05	Error initialising DSP for coefficients
06	Error loading DSP coefficients
07	Error loading DSP coefficients
08	Error sending command
09	Error sending command
10	Error sending command
11	Error sending command
12	Error with LSB/MSB configuration
13	Error with LSB/MSB configuration
14	Error with LSB/MSB configuration
15	Error configuring FPGA
99	DSP error

Table 11 - Internal Error Codes

If you get any of these, please contact ***dCS***, with as much information as possible to help us re-create the problem. Some of these may have hardware problems as their cause, some may have software.

System Messages and Error Codes

Some other messages may be displayed that give indications of errors from other sources (outside the unit):

Display	Description
n.Aud	The data has been flagged by an AES3 message as Non Audio (perhaps a CD ROM). This message may also be displayed briefly when the sample rate is changed.
Hot	The unit is overheating, and performance may suffer.
Ouch	The unit is seriously overheating, and may be damaged shortly. Switch off!
Bad Fs	The sample rate coming in is not one the unit can lock to, or there is an input signal quality problem.

Table 12 - System Error Codes

Trouble Shooting Your System

If you experience difficulties when using your ***dCS 950 / 952***, the following suggestions may help to resolve the problem.

The unit fails to power up

- Ensure there is power available on the mains cable and the unit's mains switch is On.
- Check the rated supply voltage shown on the rear of the unit matches the local supply voltage.
- Check that the fuse has not blown - if so, correct any obvious cause then replace the fuse as described in the section "**User Changeable Parts**", page 46.
- Check that the mains cable is pushed fully home into the mains inlet in the rear of the unit.

The unit fails to lock to a source

- Ensure the correct input is selected.
- Check that the digital audio cable is of the correct type, correctly connected and not damaged. Damaged cables are a VERY common cause of malfunctions!
- Check that the source is switched on.
- Some CD players or other sources do not generate a digital output unless the disc is playing - set the player in "play" mode and check that the unit locks.
- If you are using SDIF-2, set the BNC menu item to Input.

The unit fails to respond to the controls

- While locking to a source or changing some settings (e.g. Filter), the microcontroller inside the unit is busy and will not respond to new commands for a few seconds.
- Short mains supply drop-outs may cause the microcontroller to lock up. Switch off the unit, wait 10 seconds then switch on again. If this does not clear the fault, please contact your dealer.
- The Remote Control disables the front panel controls.

The audio output is low or absent

- Check that all cables are connected correctly and not damaged. Damaged cables are a VERY common source of malfunctions!
- Check that the source and destination equipment are switched on and correctly set up.
- Check that the unit is locked to the source you want to monitor.
- Ensure **Mute** is not enabled - LED off.
- Set the **Volume** control 0.0dB.
- Ensure the source is sending audio data.

The level trimmers on the rear panel do not change the output level

- Ensure the trim tool or flat-bladed screwdriver you are using is narrow enough to reach the adjuster (about 2.5mm or 0.1" diameter) and long enough (at least 12mm or 0.5").
- The trimmer may be at the end of its travel - try turning it several times the other way. It is a 20-turn device.
- The level trimmers do **NOT** affect the unbalanced outputs.

The Left and Right channels are swapped

- Check that Flip is Off.
- Check that the audio output cables are not reversed.
- Check that the channels are not swapped elsewhere in the system.
- In **Dual AES** mode (***dCS 952*** only), ensure that the **AES1** input is connected to the output on the source equipment for the Left channel data (probably labelled AES 1, AES A or Left) and **AES 2** input is connected to the output on the source equipment for the Right channel data (probably labelled AES 2, AES B or Right). See the manual of the source equipment for information.
- In **SDIF-2** mode, ensure the **Ch1** and **Ch2** inputs are connected correctly.

One output channel is low or absent

- Check that all cables are connected correctly and not damaged. Damaged cables are a VERY common source of malfunctions!
- Check that the balance is not offset elsewhere in the system.
- If the level trimmers on the rear panel have been adjusted, check that one has not been set much lower than the other.
- In **SDIF-2** mode, ensure both **Ch1** and **Ch2** inputs as well as the **Word Clock** are connected correctly.

The output is monophonic

- If the unit is locked to one wire of a **Dual AES** source, the left channel signal will appear on both channels. Select the correct inputs.
- The source may actually be monophonic.
- Check that the signal is not mono'ed elsewhere in the system.

Clicks or crackles occur on the outputs

- Check that all cables are of a suitable type, connected correctly and not damaged. In any multi-wire mode, a broken wire may not prevent the unit locking but will corrupt the data.
- This can be caused by slaving some, but not all, of the system components to a Master Clock. Note that if the unit is being driven by an upsampler, it must be slaved to the upsampler, NOT to a Master Clock.

The Display turns on briefly when a button is pressed, then turns off

- Set the 7-Seg menu item to On.

The unit fails to slave to a Master Clock

- If you are using Word Clock, connect this to **Word Clock In**. Set the BNC item to RefCl. Press the **SDIF-2** button – the unit should lock and display "**b**" (for BNC) followed by the sample rate.
- Check that the Master Clock is switched on, set to the right sample rate and does not require re-calibration.
- Connect a different piece of digital equipment to test the locking capability of the unit. If the condition persists, contact your Distributor or ***dCS***.

The sound has a peculiar tonal balance

- If the sample rate is 48kS/s or lower, the De-Emphasis setting may be incorrect. Press the **De-Emphasis** button repeatedly until the mode display shows **A** (**A**uto).
- If this fails to correct the problem, the De-Emphasis flags in the data stream may be incorrectly set (this is rare but it does happen. Press the **De-Emphasis** button to cycle through **5**, **C** and **-** in turn until the correct setting is found. When you change to a different source, disk or tape, we recommend setting De-Emphasis to **A**uto again.

dCS SUPPORT

I wish ....

If you wish your unit did something it does not, or that this manual told you something it does not, or that we made something we currently do not - tell us. If we can fix it with software, or a manual reprint, and we do so - we will update your unit free of charge. If we do decide to make the thing, we will discuss with you how you would like it to operate.

We value our customers, and we want to make products that do what you want.

If You Need More Help

Contact ***dCS***. Our office hours are 8:00 am to about 7:00 pm, Monday to Friday, UK time (UTC in summer, or UTC + 1hr in winter). Contact us by phone or fax on:

	Inside the UK	Outside the UK
Telephone	01799 531 999	+44 1799 531 999
Fax	01799 531 681	+44 1799 531 681

Table 13 – ***dCS*** Phone Numbers

You can write to us at:

dCS Ltd
Mull House
Great Chesterford Court
Great Chesterford
Saffron Walden CB10 1PF
UK

Our E-Mail address: more@dcsltd.co.uk

Our web site is: http://www.dcsltd.co.uk

Other Information

dCS produce technical notes from time to time, on issues related to ADCs. If you are interested in these, please do not hesitate to contact us.

INDEXES AND SOFTWARE VERSION NUMBERS

This manual is for software versions 6.10 and 6.2x.
v6.2x is functionally identical to v6.10, it has been harmonised with ***dCS 954***.
v6.2x versions differ only in a few minor bug fixes.

Definitions of Units

dB	A relative level in decibels. The context should state the reference level.
dB0	Level in decibels, referred to a full scale sine wave in a sampled system. So, 0 dB0 is full scale.
dBu	Level in decibels, referred to a 0.775V rms sine wave, with no external loading (u = unloaded). The level of 0.775V is derived from the older dBm, for which the reference level is 1mW of signal power into a 600Ω termination from an output with 600Ω source impedance.
dBV	Level in decibels, referred to a 1.0V rms sine wave, with no external loading.
kS/s	Sample rate in kilo-samples per second. This replaces kHz which is technically incorrect when referring to sample rates.
ADC	Analogue to Digital Converter. Sometimes referred to as an A/D Converter.
DAC	Digital to Analogue Converter. Sometimes referred to as a D/A Converter.
DDC	Digital to Digital Converter. Sometimes referred to as a D/D Converter.

Full Contents

Product Features 3
Formats 3
Syncing 3
Functions 3
Test Generator 3
Ease of Use 3

CONTENTS 4
About this Manual 5
Warranty 5

Using Your *dCS 950 / 952* For The First Time 6
Product Overview 6
What's in the Box? 6
Mains Voltages 6
Installing Unit in a Rack 6
Getting Started 8

The Hardware – Controls and Connectors 10
Rear Panel 10
Balanced Analogue Outputs 3 pin XLR male (2 off) 10
Unbalanced Analogue Outputs RCA phono (2 off) 10
Output Level Adjustment (trimmers) 10
AES1 & 2 Digital Inputs 3 pin XLR female (2 off) 10
SDIF-2 CH1, CH2 Data BNC (2 off) 10
SDIF-2 Clk In BNC 10
SDIF-2 Clk Out BNC 10
Remote 9 pin D type male 11
Mains Supply 3 pin IEC (CEE22) 11
Additional Information 11
Front Panel 12
AES1, AES2, SDIF-2 & SPDIF1 - 3 Menu Step 12
Panel Lock indicator 13
Mute Menu Set 13
Phase Menu Down 13
De-Emphasis Menu Up 14
Mode Display 14
Sample Rate Display 14

The Software – the Menu 16
Overview 16
Entering the Menu 16
Moving through the Menu 16
The Menu Sequence 17
Menu Items 18
Issue 18
DSD 18
Test 18
Data 18
7-Seg 19
Heat 19
A-Cut 19
A-Sel 19
RS232 19
Ref In 20
Tone 20
Sys 20
I-For 22
Filt 22
BNC I 22
BNC 23
BNC O 23
Panel 23
Phone 23
Facs 23
Part 23
S-No 23

Flip 23
Loc 23
End 23

Typical Applications 24
Using a Master Clock to Sync a *dCS 950* or *952* 24
Upsampling a CD player 25
Replaying 24/96 from a Nagra-D recorder 26
Six Channel Set Up 27
A / B Comparisons 28

***dCS 950 / 952* Technical Information 30**
Anti Image Filtering 30
Clocking 31
Synchronising to source 31
Sample Alignment 32
Digital Interface Specifications 33
Analogue Interface Specifications 34
Frequency Response 35
AES3 (AES/EBU) Format 36
Message Handling 36
How Far will AES3 Go? 36
SDIF-2 39
SDIF-2 Messaging 40
Power Consumption 41
Size, Weight and Operating Conditions 42
Size and Weight 42
Operating Conditions 42

Options 44
Mains Voltage 44
Video Frequency VCXOs 44
P3D, DSD Pro and Other Formats 44
Ordering Options For A New Unit 44
Having Your Options Changed 44

Maintenance and Support 46
Hardware 46
Service & Maintenance 46
User Changeable Parts 46
Software 47
Installing New Software 47
Hardware Update 47
Safety and Electrical Safety 47

TroubleShooting 48
Error Codes and Messages 48
Internal Device Error Codes 48
System Messages and Error Codes 49
Trouble Shooting Your System 49
The unit fails to power up 49
The unit fails to lock to a source 49
The unit fails to respond to the controls 50
The audio output is low or absent 50
The level trimmers on the rear panel do not change the output level 50
The Left and Right channels are swapped 50
One output channel is low or absent 50
The output is monophonic 50
Clicks or crackles occur on the outputs 51
The Display turns on briefly when a button is pressed, then turns off 51
The unit fails to slave to a Master Clock 51
The sound has a peculiar tonal balance 51

***dCS* Support 52**
I wish 52
If You Need More Help 52
Other Information 52

Indexes and Software Version Numbers 53
Definitions of Units 53
Full Contents 54
Tables 56
Figures 56
Keywords and Phrases 57

Tables

Table 1 - Phase LEDs and Channel Phasing 13
Table 2 - Emphasis Indication, low sample rates 14
Table 3 - Output Data format indication, higher sample rates 14
Table 4 – AES/EBU input specifications 33
Table 5 – SPDIF input specifications 33
Table 6 – SDIF-2 i/o specifications 33
Table 7 - Remote Control Interface Details 33
Table 8 – Balanced Output Details 34
Table 9 – Unbalanced Output Details 34
Table 10 - SDIF-2 Messages 40
Table 11 - Internal Error Codes 48
Table 12 - System Error Codes 49
Table 13 – *dCS* Phone Numbers 52

Figures

Figure 1 – Playing back a CD 8
Figure 2 – Rear panel 10
Figure 3 – *dCS 950* & *952* Front Panels 12
Figure 4 – Menu Sequence 17
Figure 5 – In-phase Sys waveform 21
Figure 6 – Out-of-phase Sys waveform 21
Figure 7 – Syncing to a Master Clock 24
Figure 8 – Upsampling a CD to 24 bit / 96kS/s 25
Figure 9 – Replaying 24/96 from a Nagra-D recorder. 26
Figure 10 – Six Channel Set Up 27
Figure 11 – Performing A / B Comparisons 28
Figure 12 – Word Clock In to Word Clock Out, 96 kS/s 32
Figure 13 – Word Clock in to Word Clock Out, 44.1 kS/s 32
Figure 14 – Filter 1 frequency responses 35
Figure 15 – AES3 format at 48 kS/s over 16 metres 37
Figure 16 – AES3 format at 48 kS/s over 94 metres 37
Figure 17 – AES3 format at 96 kS/s over 16 metres 38
Figure 18 – AES3 format at 96 kS/s over 94 metres 38
Figure 19 – SDIF-2 format at 96 kS/s 39
Figure 20 – SDIF-2 format at 44.1 kS/s 40
Figure 21 – Changing the Mains Fuse 46

Keywords and Phrases

A

AES 3, 10, 14, 18, 19, 22, 23, 33, 36, 50
AES1 button 12
AES2 button 12
analogue outputs 8, 13, 19, 20

C

Cables 49
CD player 49
Clk In 10, 33
Clk Out 10
crystal oscillator 31

D

De-Emphasis button 14, 23, 51
De-emphasis, 50/15µs 51
De-emphasis, CCITT 51
DSD 18, 22, 23, 44
Dual AES 3, 10, 12, 14, 19, 22, 50

F

filter 22, 30, 35
Filter, FIR 30
Filter, selection 22
Filter, transient response 30
fuse 46, 47, 49

G

Generator, level 20
Generator, test 20

I

input format 14

L

Lock failure 49
lockout 3, 6, 23

M

mains voltage 6, 41
maintenance 42, 46
menu 9, 10, 12, 13, 14, 16, 19, 20, 23
Menu Down button 13, 14, 16, 19, 20
Menu Set button 13, 16
Menu Step button 13, 16
Menu Up button 14, 16, 19, 20
message 14, 18, 19, 22, 36, 39, 49
Mode display 14, 19
Mute button 8, 13

N

Non Audio 19, 49

O

output level 10, 20, 50

P

P3D 44
Panel Lock indicator 13
Phase button 13, 21, 23
PLL 31
PLL Lock in time 31
PLL Pull in range 31

R

rack 6, 42
Remote 6, 11, 16, 33, 47, 50
remote control 19
remote software 47
RS-232 ..... 16, 19, 33, 47

S

Sample Rate display 19
SDIF 10
SDIF-2 ..... 3, 6, 33, 50
SDIF-2 button 12, 23, 51
SDIF-2 message 40
Single AES 14, 22
software 6, 11, 18, 47, 52, 53
software, version 18, 53
SPDIF 3, 6, 23, 33
SPDIF1 button 8, 12
SPDIF2 button 12
SPDIF3 button 12

T

Tone Generator 16, 20

U

Unlocking front panel 23
update 52

V

video 3, 44
Volume control 50

W

warranty 5, 44
Word Clock 3, 10, 15, 23, 32, 33, 39, 50, 51